

R.S. Technical Services

1545 MINI CAMERA

Model 10-1545

User Manual

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RS **Technical Services Inc.**

Design and Manufacture of Video Pipeline Inspection Systems

800-767-1974

Fax: 707-778-1981

sales.info@rstechserv.com

*Reliability
Satisfaction
Technology's Leading Edge*

www.rstechserv.com

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WEST COAST

RS Technical Services, Inc.
1327 Clegg Street
Petaluma, CA 94954
800-767-1974
Fax: 707-778-1981

EAST COAST

292 Midland Trail
Mt. Sterling, KY 40353
859 499-0122
Fax: 859- 499-0230

On The Web

www.rstechserv.com
sales.info@rstechserv.com



SAFETY NOTICE

A FIRE SAFETY CONDITIONAL APPROVAL MUST BE ISSUED BY AN APPROPRIATE LICENSED ELECTRICAL ENGINEER FOR USE OF THIS SEWER CAMERA IN AREAS OF A SEWER THAT HAVE BEEN DEMONSTRATED BY TESTING AND MONITORING NOT TO FALL UNDER THE “FIRE SAFETY APPROVAL” REQUIREMENT IN SECTION 2540.2 OF TITLE 8 OF THE CALIFORNIA CODE OF REGULATIONS. TESTING AND MONITORING WILL BE CONSIDERED BY THE CALIFORNIA DIVISION OF OCCUPATIONAL SAFETY AND HEALTH, TO BE SUFFICIENT FOR THIS PURPOSE IF ALL MEASUREMENTS INDICATE THAT THE SEWER ATMOSPHERE IS BELOW 10% OF THE LOWER EXPLOSIVE LIMIT (LEL) AND IF THE USER MEETS ALL OF THE FOLLOWING ADDITIONAL CONDITIONS:

- (1) BEFORE EACH USE, INSPECTS CABLE AND ELECTRICAL EQUIPMENT FOR DAMAGE OR WEAR THAT COULD COMPROMISE SAFETY.
- (2) TEST OPERATE THE SEWER CAMERA AND ASSOCIATED ELECTRICAL EQUIPMENT IN A DRY LOCATION AWAY FROM ANY POTENTIAL EXPOSURE TO HAZARDOUS CONDITIONS TO DETERMINE WHETHER THE EQUIPMENT FUNCTIONS NORMALLY AND WITHOUT ANY PROBLEMS, SUCH AS SPARKING, LOOSE CONNECTIONS, OR OTHER SIMILAR SAFETY PROBLEMS.
- (3) TESTS FOR THE EXISTENCE OF A HAZARDOUS ATMOSPHERE AT THE OPENING OF THE SEWER ACCESS POINT USING A MULTI-GAS TESTER, AND BEFORE ENERGIZING THE EQUIPMENT, CONDUCTS A TEST OF THE SEWER ATMOSPHERE AT THE ACCESS POINT ESTIMATED TO BE CLOSEST TO THE END POINT OF THE CAMERA WORK.
- (4) PROVIDES CONTINUOUS MONITORING IN THE ALARM MODE AT THE ACCESS POINT FROM WHICH THE WORK IS PERFORMED AT ALL TIMES WHILE THE SEWER INSPECTION CAMERA IS ENERGIZED IN THE SEWER.
- (5) DE-ENERGIZES ALL ELECTRICAL EQUIPMENT AND USES MECHANICAL VENTILATION IF A MEASUREMENT EXCEEDING 10% OF THE LEL IS OBTAINED AND DISCONTINUES USE OF ALL ELECTRICAL EQUIPMENT IF THE SEWER ENVIRONMENT CANNOT BE MAINTAINED BELOW 10% OF THE LEL.

NAMING CONVENTIONS

Throughout this manual, a standardized system is used to identify various functions or to stress importance to the reader.



This symbol indicates information that is very important to the reader. Take it seriously and follow any information provided when called for.

Black Bold Text Indicates a button, switch or important heading.



This symbol indicates operational suggestions and advice to operate the unit in the most efficient manner.

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1.0 PRODUCT OVERVIEW

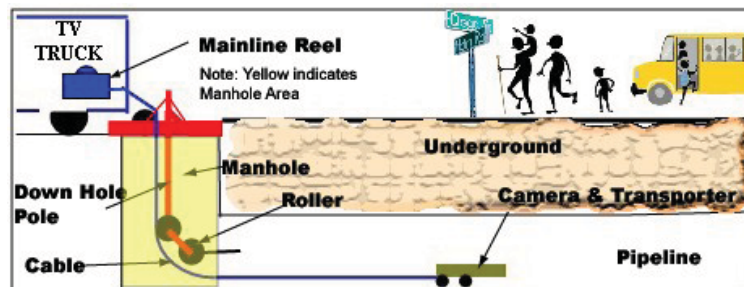
The 1545 Mini camera user manual will help you operate the camera and understand its capabilities. The small size of the 1545 is ideal for small pipelines and has superior self-leveling and automatic upright capabilities. The camera can negotiate 90° bends in two inch pipes and can operate with up to 400 feet using single Push Rod conductor cable or up to 1,500 feet using Mainline cable. The camera is remote controlled and adjustable from the operating viewing station.



The 1545 should be used in pipes with a minimum of two inches diameter without skids. Optional skids are required for pipes 4-8 inches.

Operate the camera in the same direction as the flow.

The pipeline should be as clean as possible. Water flow should be minimal, if possible.





2.0 PRODUCT SPECIFICATIONS

Power	9V to 12V DC
LEDs	Eight, High Intensity
Pipeline	2" to 8", not longer than 1500 ft. Optional skids required for 4-8" pipes.
Weight	< 1 lb.
Length	3" (7.6 cm)
Diameter	7.5" with Sleeve
Cable Capacity	To 1500 ft. with Mainline Cable To 400 ft. using Push Cable with 1514 Converter
Camera Housing	Stainless Steel. Submersible to <50 ft.
Field of View	88° Diagonal
Sensitivity	.5 lux, NTSC Color



3.0 SAFETY

It is important to be familiar with operations, maintenance, and safety issues when working with RST equipment.



Read this entire manual prior to operating the equipment.

To prevent personal injury or damage to equipment, **turn off camera power**. When making electrical connections, width adjustments, and when maintaining the tractor or camera, disconnect all power to the control station before servicing.

Inspect all transport, camera, lighting cables, and bridles before and after each use. Replace any broken, worn or frayed bridles or cables.

Always use care near an open manhole, and when climbing in or out of a TV inspection vehicle. The tractor and camera assembly can be placed into a pipeline **without** personnel entering the manhole.

Use proper lifting ropes, cranes and winches for lifting equipment in/out of pipes to prevent personal injury.

3.1 Equipment

While safety is common sense, please take time to quickly review the following, it's for your own good!



NEVER HOOK UP OR DISCONNECT ANY EQUIPMENT WITH POWER TURNED ON!

The Inspection System requires a steady supply of 90 – 130 VDC to operate properly. Before starting the generator or connecting to shore power mains, make sure that **ALL** equipment inside the vehicle has been turned **OFF**. Turn down the controls for camera power and cable reel speed. After all equipment has been checked re-connect the shore power cord.

If a generator is to be used, allow the generator to warm up for a few minutes. Verify that the voltage and frequency indicators on the controller power supply are in the **green** normal zone.

Diesel generators use a different control panel that is separate from the controller power supply. Refer to the appropriate operator manual before starting.



Before turning on any equipment, plug the keyboard into the Data Collection System. Plug the Auxiliary Control Box into the Auxiliary Control Jack on the controller power supply.



If the voltage or frequency fluctuates into the **red zones on the Controller power supply --DO NOT-- turn on any of the equipment in the truck! Check shore power or the generator for proper operation. When in doubt, have them checked by a qualified technician.**



Place cords away from traffic or wet areas to avoid tripping on power cords.

CAUTION EYE HAZARD

**Avoid long term exposure to high
intensity LED light source.**



4.0 COMPATIBILITY

Other Products to Equip Your 1545

The 1545 is designed for use with mainline vehicle mounted systems as well as Portable Mainline systems. It requires a power unit, control box, and cable reel. Use your RST product in conjunction with any or all of the following add-ons at extra cost:

-  Spring or Ball Type Tail
-  Push Rod Cable (400 ft.)
-  Anodized Aluminum Skid Sleeve with beryllium copper skid guides for 4-8" pipes
-  Sonde Transmitter
-  Mainline Cable (1500 ft.)

5.0 OPERATING YOUR 1545

Using the Mainline Controller

The optional 1514/1515 voltage converter must be used in conjunction with Mainline series controllers (1309, 1315, and 1575). The 1514 converter can be mounted to the Push Rod cable reel.



Connecting your 1545 camera to any type of controller/power supply other than a RST 1515 or 1514 voltage converter may cause damage to the camera and void the warranty.

Fig. A



The Controller receives its operating power and control signals from an above ground controller power supply. The underground equipment transmits video and other transducer signals back to the Controller Power Supply. The Controller Power Supply is a component of a pipeline video inspection system, which may be mounted or portable.

The Functions of the Controller Power Supply are divided into three sections (refer to **Fig. A**):

1. Power (far left hand section)
2. Camera (center section)
3. Reel (far right section)

Prior to using the Controller and powering up, do ALL of the following:

- ✓ Ensure that the Camera **ON/OFF** switch is in the **OFF** position **before** connecting the camera to the transport unit, and \or auxiliary Dual Function Control Box to the Controller Power Supply.
- ✓ Ensure the large black **Voltage Control** knob is set to MINIMUM (full counter clockwise position).
- ✓ Ensure the **Reel Speed Control** knob is set to MINIMUM (or full counter clockwise).
- ✓ Turn the **Camera Power** switch to **ON**. A video picture should appear on the display. If the video picture is flashing off and on, the camera voltage setting is too low. Increase the voltage setting until the flashing stops.

Note: In some cases the minimum controller voltage setting may be below the camera's minimum operating voltage.

Once completed, power up the Controller unit, the Frequency & AC Voltage readout in the Power Section should read NORMAL.

5.1 Section Details of the Controller

5.1.1 Power

A Remote Control Unit starts and stops the onboard generator in order to operate the transport and camera. The **Start/Stop** switch activates power.

The Generator Runtime Meter measures the continuous operating time of the generator set. There is no reset button. This meter is useful to determine the maintenance requirements of the generator. Generally, every 100 hours of use may require maintenance (this varies with generator).

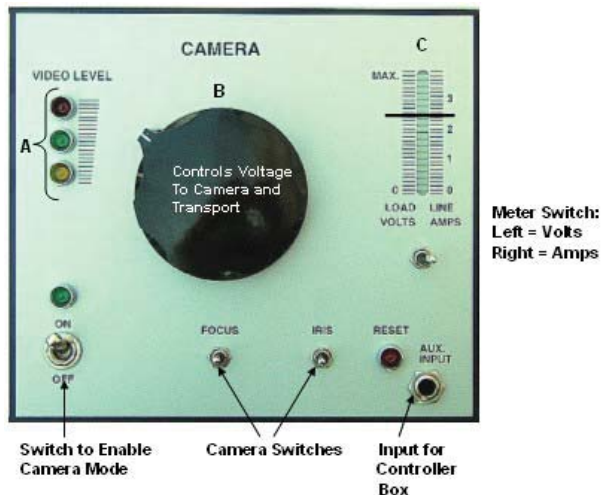
The two indicators (Frequency & AC Voltage) monitor the incoming line voltage and frequency. A continuous, steady high voltage level may indicate a problem.

The control voltage for this section is supplied by the generator set and is a nominal 12V DC (9V DC to 16V DC).

5.1.2 Camera

The adjustable camera light power supply provides a nominal 120V DC to the camera and other down-hole inspection equipment, such as the transport. This section has video processing circuitry which extracts the video transmitted by the underground camera into a NTSC video format. Incorporated in the controller is an audio microphone preamplifier that can provide audio for a VCR or DVD. Some cameras have a non-adjustable light intensity, others have an adjustable light intensity from an auxiliary controller.

Fig. B



The Camera **ON/OFF** switch controls the camera power supply. Above the switch is a green LED to indicate that the camera power supply is on.

The large, black, **Voltage Control** knob adjusts the output voltage of the power supply. This control adjusts the light intensity of the remote camera and adjusts the speed of the transporter unit.

Refer to **Fig. B** (previous page). This is a detail of the Camera section of the Controller.

Video Level (A)

If there is no light, there is no camera signal being received. Assuming a signal is received, the **Video Level** lights indicate whether sufficient light for the camera exists within the pipe.

There are three colors:

Yellow - Insufficient light, too dark. Open the camera iris further.

Green - Ideal lighting and iris setting. This is normal.

Red - Too much light or video problem. Close camera iris.

Voltage Control Knob (B)

Use the first mark as a general reference when turning the **Voltage Control** knob clockwise. In most cases, the normal range is reached when it is reached (this mark is NOT on the panel, but is used only to provide the reader with general knowledge).

Load Volts\Line Amps (C)

Use the toggle switch to view the Load Volts or Line Amps. The general normal range for Line Amps is usually one or less but can be up to 2.5. The “flame” indicates an operational danger zone. It displays the relative output voltage or current from camera power supply. The switch located below the indicator toggles between voltage and current.



If the Line Amps reading is three or higher and is steady, SHUT DOWN the camera immediately to avoid damage!

This condition usually occurs if there is a snag or crimp in the reel cable or a serious connection issue.

Manual Switches

As indicated in **Fig. B**, either may be used to focus or for iris adjustments. Toggle back and forth. The Iris Switch controls the iris setting in fixed lens cameras and the zoom setting in cameras with zoom capability.

Reset

A flashing **red** RESET indicates that the power supply was overloaded and the power supply is disconnected from the output connector.

To reset, do the following:

1. Place the camera **ON/OFF** switch to the **OFF** position.
2. Turn the camera **Voltage Control** knob to minimum (counter-clockwise) and wait 45 seconds to allow the power supplies to discharge.
3. Place the Camera **ON/OFF** switch to the **ON** position. If the RESET continues flashing, place the camera **ON/OFF** switch to the **OFF** position and correct the fault.

Aux. Input

Use this to connect a remote control device or an auxiliary Dual Function Control box.

5.1.3 Reel

Refer to **Fig. A**. This section controls the cable reel that is sent through the pipe with the camera. In effect, it operates a winch-like device to send and retrieve the cable.

The **Speed** knob determines how fast the cable is moved. Under the **Load Amps** meter, there are two switches. Directly below the meter is a gear-like switch allowing for high, low, or neutral for the reel. Below this, is another switch used to indicate whether the cable is being pulled out or sent in.

The **Load Amps** meter is similar the one in the Camera section. If the meter remains steady at a high level, shut down the reel. Again, check connections and cable for crimps or snags.



If, after careful inspection of cable and/or reel, no snags or crimps are found, call (800) 767-1974 or (707) 769-8806 for tech support and further troubleshooting.

5.2 Auxiliary Control Box

With the power off, plug in the Dual Function Control Box into the front panel jack marked **Aux Input**. Use this box for precise control and to create a variety of configurations for your camera/transport. The box below is used with all RST cameras **except** those in the OmniSTAR family. Depending on the camera used, certain functions using the toggle switch may require repeated toggling until the desired effect is reached.

To help explain its functions, colored text is used on the Controller box:

Blue Text The selected function occurs in **Zoom** Mode.

Red Text The selected function occurs in STD Mode.

Fig. C



5.2.1 Modes

There are two modes: **STD** and **Zoom**. Each mode has 16 possible functions that adjust the attached camera or move the transport (STD Mode only). The text on the buttons is either in red or blue to differentiate between Standard (**STD**) and **Zoom** modes for easy reference. A Mode is selected using the Rocker Arm (see Fig. C).

5.2.2 Standard Mode (STD)

In Standard Mode, common functions are pan, transport speed (when present), camera rotation, iris, and focus.

To enter STD Mode, do the following:

1. Push the rocker mode switch (on the top of the box) to the left (refer to Fig. C). The STD will be flush with the box.
2. Select either a button and push down to activate that function or use a toggle switch. Observe the results on the monitor or transport.

Every function change will cause a corresponding flash of the green transmit LED in the middle of the control box.

5.2.3 Transport Movement

To move the transport or tractor (when present), do the following:

1. Push the **High**, **Medium**, or **Low** button to move the transport forward at that rate of speed. To move the tractor in reverse, push the **Free Whl.\Reverse** button.

To retrieve your transport\tractor, do the following:

2. Push the **Free Wheel** button to retrieve a tractor from an inspection run. Wait five seconds. Observe the tractor moving in a backward direction. Push **Stop**. Go to the Reel portion of the Controller (see Fig. A). Retract the cable by turning the toggle switch to **On**. Adjust the **Speed** knob; select **OUT**, select **Low** or **High** using the toggle switch.

5.2.4 Standard (STD) Button Descriptions

Note: Other cameras may have additional functions, see specific camera manual. The Standard buttons that control the transport are operational only when a transporter tractor is present.

High (transport)	High speed mode
Medium (transport)	Medium speed mode
Low (transport)	Low speed mode
Free Whl. /Reverse (transport)	Free wheel- hold down reverse in STD mode
Stop (transport)	All stop- hold for three seconds
Pan Left (camera)	Pan left
Pan Right (camera)	Pan right
CCW (camera)	Counter clockwise rotation
CW (camera)	Clock wise rotation
Home/lights (camera/STD)	Rotates camera to home/turns on SDT lights

Toggle Switch Descriptions

Iris Cl. (camera)	Closes camera iris
Iris Op. (camera)	Open camera iris
Focus in (camera)	Adjust near focus
Focus out (camera)	Adjust far focus
Lft. Turn/elev down	Turn left or Lower elevator/camera elevator
Rt. Turn/elev up	Turn right, raise elevator/camera elevator up

5.2.5 Mode Button Descriptions

Iris (camera)	Adjust lens F-stop (f2.8, f4, f8, f10 etc.) <i>Note: adjustments are not recommended.</i>
Auto foc. (camera)	Switch between auto focus and manual focus. Auto focus is default (no auto focus adjustments). In manual mode, adjust Focus in/ Focus out with toggle.
Shutter (camera)	60 frames per second can be slowed to give more time to absorb light, and also to give a slow motion affect. <i>Note: Adjustments are not recommended.</i>
Freeze (camera)	Stop the motion of live video.
Wht. Bal. (camera)	Adjust for light type. Incandescent light (auto).
Display (camera)	Show or hide manual settings.
Gain (camera)	Adjust gain (brightness) using slide bar.
BK Light (camera)	Increase screen brightness to light up shadow areas.
Reset (camera)	Return to power up default settings.

Toggle Switch Settings

Wide	(Z camera)	Zoom in or zoom out
Tele	(Z camera)	Telephoto 10x optical, 4x digital, overall 40x
Up	(Z camera)	Adjust zoom functions (Iris, Shutter, Gain)
Down	(Z camera)	Adjust zoom functions (Iris, Shutter, Gain)
Focus in	(Z camera)	No camera controls
Focus out	(Z camera)	No camera controls

5.3 Operating Your 1545 Camera

The following are some basic, general methods to adjust your camera after it has been inserted into a pipe.

1. Turn camera **Power** on.
2. Check the picture on the monitor and adjust brightness, if needed, by pushing the **Gain** button and using the **Up/Down** Iris toggle switch.
3. Adjust **Auto Focus** (most cameras have auto focus). If a manual focus is needed, push the **Auto Focus** button and use the **Foc. in/ Foc. out** toggle switch to adjust. Repeated toggling is OK.
4. The Shutter is automatically set. To adjust it using manual control, push the **Shutter** button and adjust using the **Up/Down** toggle switch.
5. To reset to standard settings, use the **Reset** button.

5.4 Conducting a Pipeline Inspection

The following is a brief general overview of inspecting a pipeline after it has been inserted and readied (camera adjusted for height and lighting). Do the following:

1. Start the VCR or DVD.
2. Record condition of manhole.
3. Start recording inside pipeline (you may have to start before the footage is set).
4. Move the camera through pipeline slowly to spot defects. Do not force camera past large amount of debris.
5. Look for large root masses that may block the pipe, or severe offset joints between pipes or protruding laterals. Use extra caution when observed.
6. Take notes when passing obstacles or severe offset joints, protruding laterals. Stay away from hazards that may create a “stuck” situation!



6.0 GENERAL OPERATIONS

The following are quick-start general steps typically used with the 1575, and general maintenance for the camera.

CONTROLLER

1. Turn the **ON/OFF** switch to "**OFF**"
2. Turn the **LIGHT INTENSITY** control fully counterclockwise.
3. Connect the flexible, RG-58 lead from the Cable Reel to the **CAMERA POWER** jack on the controller.
4. Connect the footage cable (optional) connector from the reel to the

FOOTAGE JACK (on the controller).

1. Plug in the microphone jack (optional) into the control panel jack (**MIC.**).

CAMERA

1. Check that the LED lights and the LENS are clean. If necessary, clean with a soft cloth or tissue.
2. Select and attach the appropriate SKIDS for the size of the line to be inspected. *CAUTION:* If the optional adjustable skid set is being used, be sure that the standoffs, which are threaded into the aluminum sleeve, do not protrude into the inside of the sleeve. If the threaded stud on the

standoff is too long, and is tightened against the camera body tube, the tube can be distorted, and camera leakage can result.

3. Connect the camera to the push cable. The junction may be wrapped with vinyl electrical tape to provide extra security.

POWERING UP

1. Before connecting the system to the 120 VAC power source, be sure that the **ON/OFF** switch on the controller is set to "**OFF**".
2. Connect the controller to **120 VAC** using a three-pin grounded cable.
3. Turn the **ON/OFF** switch on the controller to "**ON**." Initial start-up may produce a 2 to 3 second period during which the LED lights flicker before an image appears on the monitor.
4. When performing a video inspection, the camera light intensity may be adjusted by turning the **LIGHT INTENSITY** control. If the LED lights start to flicker, the camera power has been adjusted too low. Turn off the power and repeat step 3.

6.1 1545 Maintenance

HANDLING

The 1545 Video Camera is durable, but contains electronic components, which may be damaged by a hard impact.

The 1545 Video Camera contains a solid state CCD sensor which should be protected from excessive exposure to the sun's rays. Momentarily pointing the camera at the sun will not cause damage to the sensor, but allowing the camera to remain pointed at the sun should be avoided.

SUBMERSION

The 1530 Video Camera is water resistant, and may be immersed in water. However, it is not designed for deep submersion. Do not operate at depths greater than 50 feet.

CLEANING

The 1545 Video Camera should be cleaned after each day's use. Any non-abrasive household cleaner or disinfectant may be used. The camera may

be washed off with a light jet of water, but never use a high-pressure wash, because the water may be forced past camera seals.

The camera window must be kept clean; even a little dirt on the objective lens window will reduce the sharpness of the video image.

At the end of each day, remove any tape from the camera/cable connection. Be sure the camera connector is clean; blow out any excess water and let the connector dry.

STORAGE

The 1545 Video Camera should be stored out of the sun and protected from impact. If the Camera is stored on the push cable reel, avoid kinking the camera tail.



7.0 PIPELINE INSPECTION

General Guidelines

7.1 Vehicle & Equipment Placement

1. Locate the back of the truck so that the cable reel lines up in the direction of the pipeline to be inspected. The truck rear should be over or \near the pipeline entrance.
2. Create a buffer zone around the opening while carrying the equipment when in traffic areas. Use pylons and \or warning signs to alert traffic.
3. Pull the camera/tractor far enough into \over the pipeline entrance to clear the bridle or cable grip. Check all camera and tractor functions again before proceeding.
4. Move tractor forward so the rear of the tractor and the cable connections are fully inside the pipe.
5. Set up Down hole Poles, shoes and Manhole Roller.
6. Reset the footage counter.
7. Release the Drag Brake on the cable reel.
8. Set cable reel in Free Wheel mode.
9. Read and follow Cable Grip, Bridle and Pig Tail instructions.
10. Re-check the pipeline size and extension adjustments.
11. Do not let cable “loop” occur at the location where the cable enters the pipeline.

12. Use Guide Poles and hook to keep your Crawler stable as it enters pipeline (use enough poles to clear top of the manhole by two feet). Pull the camera/crawler far enough into pipeline to clear the Bridle or Cable Grip.
13. Set the Cable Guide. Use double roller and/or single rollers to protect the cable and allowing it to slide down the hole without drag on the line.
14. Lower the equipment slowly until destination is reached.



Maintain control of equipment while loading and unloading into manhole. Most equipment damage occurs when camera is lowered into hole.



8.0 PRODUCT WARRANTY

RS Technical Services, Inc. (RST) warrants all items of our manufacture for defects in materials and / or workmanship for one (1) years from date of receipt by the Customer (unless otherwise stated).

This policy is limited to items manufactured by RST (i.e., Camera, Reels, Controllers, Data Displays, Winches, and Tractor Transport Vehicles).

In the event of any malfunction of failure of the equipment, the customer is required to request authorization from RST to return defective parts or components by calling the RST toll-free number- **1-800-767-1974** and requesting an MRA number.

The returned parts or components shall include a packing list, part identity, and the reason for the return of the part.

Freight costs are the responsibility of the Customer unless otherwise agreed to in advance by RST. All in warranty equipment in need of repair shall be shipped to:

RS Technical Services, Inc.	or	RS Technical Service, Inc
1327 Clegg St.		292 Midland Trail
Petaluma, CA 94954		Mt. Sterling, KY 40353